Truth Triumphant:

3

OR,

FLUXIONS

FOR THE

~~Pam 38~~

LADIES.

SHEWING
The CAUSE to be before the EFFECT,
and *different* from it;
That *Space* is not SPEED, nor
Magnitude MOTION.
WITH
A PHILOSOPHIC VISION,
Moſt humbly dedicated to his ILLUSTRIOUS,
HIGH, and SERENE EXCELLENCE,
The SUN.

For the Information of the Public, by $\dot{X}$, $\dot{Y}$, and $\dot{Z}$,
who are not of the Family of x, y, z, but near Relations of x', y', and z'.

When e'er you cenſure Foe *or* Friend,
Be ſure you have ſome moral End;
Let all you ſay be juſt *and* true,
No Matter what is ſaid of you.
MORAL MEMOIRS.

LONDON:
Printed for W. OWEN, at *Homer*'s Head, near *Temple-bar*; and ſold by the Bookſellers in Town and Country.
M.DCC.LII.

TO THE
Grand ILLUMINATOR,
His Illuſtrious, High, and Serene EXCELLENCE,
The SUN.

SIR,

YOUR *Excellency's* high Birth, ancient Family, noble Atchievements, and tranſcendent Virtues, are ſo univerſally known and acknowledg'd, that it WOU'D BE needleſs and vain for the ſublimeſt Pen to recite them. Your *Excellence* is ſo conſpicuous! that you cannot improve by Commendation, nor can your Glory diminiſh by Reproaches of the Invidious. Your high Dignity is *invariable*, your Conſtancy immutable, and you are above all Temptation, Bribery, and Corruption. *Alexander*, of our Family, own'd but one Superior, namely, your Excellence; and poor *Darius* was forc'd to ſubmit to Fate!

I ſincerely congratulate You on your *eternal Glory*! deriv'd from your eminent Skill in, and Encouragement of, the Liberal Arts; eſpecially from amply rewarding all your *Dedicators*, and accepting of their Dedications *unask'd*.

The Family of the WOU'D-BE'S in this Iſland is become very numerous, by *uniformly* continuing in their Errors; yet your Excellence wou'd never permit the moſt dignified of them all, as a *Bar* to the Preferment of the worthy and reputable Family of the SHOU'D-BE'S, to whom the *Had-been's*, *Have-been's*, and *May-be's*, always ſubmitted; as the WOU'D-BE'S have been forc'd to do, in an eſpecial Manner of late.

I thank your Serene Excellence for all your Favours conferr'd on my poor Merit; but more eſpecially for the *Gold Mine*, and Ridge of *Diamonds* you ſhortly intend to beſtow on

Your High Excellency's

moſt faithful,

and obedient humble Servant,

PREFACE.

A*S the* Ladies, *in the Orb of* Jupiter, *have made ſuch wonderful Improvements in Science and Literature, as to have rendered themſelves immortal; it is doing Honour to the* Britiſh *Nation to mention thoſe ſhining Examples of our own Orb,* viz. *The truly Honourable the Lady* Terra; *the Excellent Miſs* Sophia Weſtern, Nonparelia, *and* Newtonia, *with ſome Others, diſtinguiſhed for their uncommon Talents, and learned Skill; eſpecially in the Principles, and Application of Fluxions.*

It is with a View of cultivating the Ladies *excellent natural Parts, in general, that we have ventured to lay the following* Sheets *before them, upon the Subject of Fluxions, in order to do Juſtice and Honour to the* Truth.

Fluxions, *then,* Ladies, *that have ſo puzzled our* wiſe *Mathematicians to* define, *are the reſpective Degrees of Motion, at any* Inſtant *of Time, of any* two *Things or Bodies that continually flow, or move on, over Space; that is, ſuppoſing one of thoſe Things or Bodies, moving always alike, to be the* Standard *Motion to meaſure the Motion of any other Thing or Things by, moving faſter or ſlower, always alike; or faſter or ſlower continually different.*

Thus Motion, Ladies, (diſputed by the Sceptics) *is the evident* ſhifting *of Places of Bodies, while the reſpective Quantity thereof, at any Time, is determined by the laſt* little *Diſtances mov'd over together, in a very ſmall Time, by thoſe Bodies; to which Diſtances the ſaid Motion is always* nearly *proportional; becauſe it is* nearly uniform *in that ſhort Time. But if both Motions be exactly uniform, or always the ſame, the Diſtances moved over, by Things, or Bodi*

The Ladies, *if they pleaſe, to jump over what follows between Crotchets.*

[One of the Motions being variable, while the Standard Motion, to meaſure it by, is conſtant, the *little* Diſtances, mov'd over together, in a very ſmall Time, are *little Increaſes* of the *whole* Diſtances (called the *Fluents*) firſt mov'd over. Now, if x Diſtance, or *Fluent*, mov'd over with uniform Motion be increaſed by the ſmall Diſtance x', and becomes $x+x'$, then x^2, another Diſtance, or *Fluent*, to be mov'd over in the ſame Time, with Motion continually ſwifter, will be increaſed, and become $x+x'$ ſquar'd, or $x^2+2xx'+x'x'$, where the Increaſe of Diſtance, by the uniform Motion, is x', and that by the continually ſwifter Motion, $2xx'+x'x'$, as x' to $2xx'+x'x'$ or 1 to $2x+x'$ by Diviſion; therefore conſidering x' Diſtance of Increaſe leſs and leſs, till, with the *geometrical* Increment, it becomes $=0$ Value, at the Diſtance, or *Fluent*, firſt mov'd over, where the Degree of Motion is requir'd, the Proportion becomes exactly 1 to $2x$ for the *relative* Quantity of *Fluxions*, or Degrees of Motion, at x, and xx, Fluents mov'd over, required. The ſame Method finds alſo the Degrees of Fluxion or Motion, at all other Spaces mov'd over by a *Point*, *Line* and *Surface*, *numerically* repreſented by *algebraic Quantities*, or Diſtances to be relatively mov'd over together: And ſo, by the Degrees of Motion or Fluxions, given, the *Fluents*, or Spaces mov'd over together thereby, at any Time, may be determined. Thus, in Nature,

It is found by Experience, that a heavy Body falls faſter and faſter continually, and falls $16\frac{13}{100}$ Feet in the firſt Second of Time, when it acquires ſwiftneſs that *wou'd* carry it *uniform-*

The Swiftneſs of the falling Body increaſing in each ſucceſſive Moment of Time, in an arithmetic Progreſſion, the *Velocity*, at *every Diſtance* of Space *fallen thro'*, *muſt* therefore *be proportional to the Time of the Fall*; and the whole Quantity of Space paſſed over muſt be *proportional to the Sum of all the variable Velocities in all the Moments of Time*; that is, to the Number of Terms in Seconds, (beginning at *o)* multiplied by the laſt Term of Velocity, and divided by 2. And taking 1 Degree of Velocity to 1 Second, 2 to 2 Seconds, and ſo on, the Squares of each Second of falling, divided by 2, will be as the *Spaces* deſcended; and therefore the *Squares* of the Times, or Velocities, will be alſo as thoſe Spaces; and the Velocities, or Seconds, at the End of the *Fall*, will therefore be as the Square Roots of the ſaid Spaces; that is, as the Square Root of $16\frac{13}{100}$, is to 1 Degree of Velocity, or Second of Time in falling, ſo is the Square Root of another Diſtance, *x*, fallen thro', to its Degree of Velocity, or Seconds, $= \frac{x^{\frac{1}{2}}}{4}$, nearly, or exactly

$$\frac{x^{\frac{1}{2}}}{\overline{16.13}|^{\frac{1}{2}}}$$

And, if the *Swiftneſs* acquired at the End of any Time fallen, were uniformly continued for that Time, it *wou'd* paſs over double the Diſtance fallen; becauſe the *Sum* of all the invariable Velocities, ſo continued, wou'd be the Number of Seconds ſquared, or firſt Term of Velocity, into the ſame Number of Terms in Seconds; whereas the *Sum* of all the variable Velocities, in falling, were ſhewn to be but *half* the ſquare Seconds, during the ſame Time of Motion.

Hence it follows, that, in every ſucceeding Second, after the firſt, the Spaces fallen thro', from the Beginning of Motion, will be 4, 9, 16 cond, reſpectively. And the *Differences* of thoſe Times taken, will be 3, 5, 7, 9, *&c.* Times, the Diſtance fallen in the firſt Second, for the ſeparate Diſtances fallen in each Second after the firſt.

And, becauſe the ſaid *odd* Numbers of Increments of the Fall, become nearer and nearer to Equality, as they become greater and greater, *&c.* the uniform accelerated Motion approaches nearer and nearer to a Motion intirely uniform; to which the Denſity of the *reſiſting* Medium the ſooner reduces it. And, becauſe the Time of a *Pendulum*'s Vibration in the Arch of a Cycloid is demonſtrated to be, to the Time of a falling Body thro' half the Pendulum's Length, as the Circumference of a Circle to its Diameter, it is proved, *a priori*, that 16 Feet=Space, deſcended in a Second, or in one Vibration of a Pendulum 39, 2 Inches.]

The ſame Reaſoning, Ladies, *by* little Increaſes, *holds good in finding the Quantity of Motion of* Bodies *moving over Spaces directly forward; or in curve Lines, according to any other Laws of deſcribing* Fluents, *or Spaces, in the ſame Time.*

The Quantity of Motion, or Velocity of Rivers, between narrower or wider Banks; that of the Fall of Water thro' a given Orifice; *as well as the Motion of* Venus *thro' her* Orbit, *are computed; and,* vice verſa, *the Diſtances, or* Fluents *paſs'd over, are computed from the Fluxions, or Velocities given.*

A Fluent, Ladies, *is a* Maximum *or* Minimum, *or Greateſt or Leaſt in Quantity, when the Quantity of Motion, at either of thoſe* Fluents *deſcribed, is equal to Nothing; becauſe then* (like the longeſt or ſhorteſt Day, at the *Solſtices*) *it neither increaſes nor decreaſes for a certain Time.*

If this Doctrine *is approved of, the* Ladies *may be taught the right Uſe of the* Globes, *Drawing in* Perſpective, *&c. by the ſame Authors, in a very ſhort Time.*

$\dot{X}$, $\dot{Y}$, and $\dot{Z}$

AN

ANSWER

TO

JOHN TURNER's *Obſervations*

ON

Some unanſwerable REMARKS *made on* *Mr.* SIMPSON's FLUXIONS, *firſt publiſhed in the* Monthly Review *for* December, 1750.*

By X PRIMUS.

THERE is lately come to my Hands a ſmall Pamphlet, call'd *The Mathematical Exerciſes*, written by one *John Turner*. This Writer falls foul upon the Author of a Criticiſm (as he calls it) upon Mr. *Simpſon's* Fluxions; tho' it is no *Criticiſm*, but only a few curſory *Obſervations*, made here and there in reading the Book. Who this *John Turner* is, whether he is Mr. *Simpſon*'s Clerk, or his *Pupil*, or ſome Dependant on him; or whether he be Mr. *Simpſon* himſelf, is not very material to the Reader, nor to me: All that I have to do, is to make a few *Remarks* upon what *John* has written, and obliged the World with, in this

excellent

(* *See the End of this Eſſay*)

excellent Performance, called *The Mathematical Exerciſes*, lately expir'd!

After a great many Grimaces made, and Compliments paid, to the ſuppoſed Author of the Criticiſm, and ſeveral Encomiums given him which he has no Right to, he enters upon his Subject; and the firſt Thing he attacks him for, is for ſaying, that many Things are treated with Confuſion; and from thence he undertakes *to prove, to a Demonſtration, the extreme Ignorance of the Author in the firſt Principles, and moſt common Part, of the Subject.* But he has happened to leave out his Demonſtration; and, I ſuppoſe, he had good Reaſon for it.

The next Thing he is angry at, is, that he aſſerts Mr. *Simpſon* miſtook the *Effect* for the *Cauſe*. But what ſays *John?* Why, *John* ſays, "It is unjuſt, and without Foundation; that Mr. *Simpſon* builds upon his own Definition, and tells us himſelf, it is not exactly the ſame as that of Sir *Iſaac Newton*" (he ſhould ſay, not at all the ſame) "and that he ought not to be accountable for an injudicious Commentator not being able to reconcile the one with the other." We hope, therefore, that *John* will be able to reconcile the One with the Other, as ſoon as he is able to reconcile *Light* and *Darkneſs* together, as we ſhall ſee afterwards.

But our Author, it ſeems, is very clear of *Plagiariſm*; he has taken nothing from any Body; and the Rules he has given for determining the Sides and Angles of ſpherical Triangles, are all his own; becauſe he has drawn ſeveral *Corollaries* which *Cotes* has not, and alſo becauſe he has put them into a different Method and Dreſs; yet it is eaſy to ſee, that there are ſeveral Things taken from other Authors, as well as from *Cotes*, and put into a different Dreſs, how innocent and demure ſoever *John* may appear to be.

Indeed, his Definition of Fluxions, I believe, no Body will claim but Himſelf; neither do I think any Body has any Right or Title to it. And here it is that *John* collects together all his *Might*, and lays out all his *Logic*, to make good this Definition. In order to which he divides his *Forces* into two diſtinct Bodies, to encounter and batter down the Allies' two extraordinary Poſitives. The Firſt, or Right *Wing*, is to deſtroy their firſt Poſition, concerning Quantities generated uniformly; and the Second, or Left *Wing*, has ſtrict Orders utterly to demoliſh their ſecond Poſition of Quantities generated by a variable Law. Alas, alas, what muſt be done with ſuch an Enemy as this; that will give no Quarter, but lay all waſte before it! *and prove to a Demonſtration, that the Commentator*, or General *of the* Allies, *has neither Veracity, Perception, Reaſon, Senſe nor Modeſty.* But let us ſee what *John* ſays: His firſt Poſition, as *John* ſtates it, is this, "That in Quantities uniformly generated, the Fluxion muſt (according to the ſaid Definition) be the Fluent itſelf, or elſe a Part of it." To this, *Firſt* (ſays *John*) I anſwer, *That the Fluxion is neither the Fluent itſelf, nor a Part of it; it is a Quantity of the ſame Kind with the Fluent, but the Fluent being the Quantity already produced by the generating Point, Line, or Surface, ſuppoſed ſtill in Motion; and the Fluxion what will ariſe hereafter from the Continuation of that Motion, the Latter can no more be denominated a Part of the Former, than the enſuing Hour a Part of the Time paſt.* Well ſaid, *John*; but ſtop a little.

John ſays, the Fluent being the Quantity already produced—Pray how was this Quantity produced, by ſome *magic* Art, without any Fluxion? I believe not. The Fluent has in every Point of its Generation its proper Fluxion; and ſince we are told, *That the Fluxion is the Magnitude by which the flowing Quantity* WOULD BE *uniformly increaſed in a given Time*, it follows, that at the Expiration of that given Time, the following Quantity being always in Motion *actually is* uniformly increaſed by that Magnitude. And being thus actually increaſed through all theſe given Parts of Time, from the firſt to the laſt Point, all theſe Increaſes muſt make up the Fluent, or Thing generated, being of the ſame Kind; as the Sum of all the Parts make up the Whole of any thing. This bears hard upon *John*, but there is no Help for it.' And therefore it ſeems not a little ſurpriſing, among the Millions of Millions of Points in the generated Quantity, each having its proper Fluxion, how *John* ſhould take it in his Head to exclude us from the Conſideration of every one of them, but only at the *very laſt*, where the Fluent is to end, and increaſe no more. But this is doubtleſs owing to *John*'s great Reaſon, Perception, and Senſe. For my Part, I know of no Body that ever ſaid, that the Parts of the Fluent that went before were generated by the Fluxion that is to come after, but every Part by its proper Fluxion, for the Time then being; according to the true Senſe and Import of this *wiſe Definition*.

But there ſeems alſo to be a little of *John*'s ſophiſtical Juggling contained in the Account he gives of the Fluxion, even at this laſt Point of the Fluent: For he tells us, *That the Fluent is the Quantity already produced by the generating Point, Line, or Surface ſtill in Motion, and the Fluxion what will ariſe hereafter from the Continuation of that Motion.* Whence it naturally follows, that the Motion being *actually* continued, that Quantity, called the Fluxion, *actually* will ariſe, and become Part of the Fluent, unleſs he ſuppoſes the Fluent both to end, and not to end, at the ſame Time; ſo that *John* ſeems here to be got into a *Quagmire*, and like to ſtick faſt in the *Mud*, along with his *Great Maſter*, till ſome of greater Penetration ſhall help them both out.

This being diſpatched, he comes to his ſecond *grand Article*, which is, to confute and demoliſh the Ally's ſecond Poſition, That in a Quantity generated by a variable Law, the Fluxion will not be a real, but an imaginary Thing. And here we muſt again have recourſe to the Definition itſelf, which is this, *The Fluxion is the Magnitude, by which any flowing Quantity* WOULD BE *uniformly increaſed, with the ſame Celerity continued.* From which it is plain, if the Celerity be continued, or, which is the ſame, if the flowing Quantity be uniformly increaſed by any Magnitude, that Magnitude is a *real* Thing. But, on the contrary, if there be no

Magnitude by which the flowing Quantity is really increaſed, ſuch a Magnitude is not a real, but an *imaginary* Thing only; for what only *wou'd be*, but *never really is*, can never be called a real, but an *imaginary* Thing, without confounding the Senſe and Meaning of Words. He aſks, " Does it follow, becauſe a Bo-" dy really moves over a certain Diſtance in a given " Time, with an accelerated or retarded Velocity, that " there is no Diſtance over which it *might paſs* (obſerve " might paſs) in the ſame Time, with its firſt Velocity " uniformly continued?" Yes; but then 'tis an *imaginary* Diſtance in regard to the Motion of that Body, and the firſt Diſtance is only *real*: Likewiſe, a Diſtance of 32 Feet, which a falling Body would deſcribe, but really does not, is only imaginary, in reſpect to the Line deſcribed by the falling Body. And if *John* could ſet off never ſo many *real* Diſtances in free Space, yet that is nothing at all to his Purpoſe; for any ſuch Diſtance ought not only to be *real* in itſelf as a Diſtance, but muſt alſo have a *real* Relation to the Line deſcribed by the falling Body, ſo as to be its Fluxion, and to be really deſcribed uniformly, as the Definition requires. But ſuch a Relation not exiſting, but only in his *Imagination*, the uniform Increaſe of the Line deſcended through is not real, but only *imaginary*. And therefore it is ſtrange Perverſeneſs and Stupidity in *John*, not to diſtinguiſh the Difference between the Meaning of a *real Diſtance*, and a Diſtance that only *wou'd be* deſcribed. But *John* thinks, that every Thing that exiſts in his *Imagination*, really exiſts in *Nature*, he not being able to make the leaſt Difference. But if it was not for putting *John* in a Paſſion, I could point out ſome other Abſurdities in this Definition. As for *Example*: It is well known, that Sir *Iſaac Newton* defines Fluxions by the Velocities of the Motions. But Mr. *Simpſon* declares againſt this, and likewiſe tells us, that by taking Fluxions for mere Velocities, the Imagination is confin'd, as it were, to a Point. How *his* Imagination is confin'd, I don't know; but Sir *Iſaac Newton* chuſed to define it thus, as very well knowing, that this is the only *ſolid* Foundation upon which it could be defended againſt all the impertinent Cavils of ignorant or weak Pretenders. He finds Fault too with Sir *Iſaac Newton*'s Method of demonſtrating by the Help of *Increments*; but all this is mere trifling, to ſay no worſe of it: For neither Sir *Iſaac Newton*, nor any Body elſe, can demonſtrate a Propoſition from itſelf, without any intermediate Steps. And, therefore, Sir *Iſaac Newton* makes Uſe of the Moments, as being the immediate *Effects* of theſe Velocities, as the proper *Medium* whereby he proves his *fundamental* Propoſition: Beſides, his imaginary Difficulty in conceiving a Motion at a Point, is not at all avoided here: For before we can underſtand any Definition of Fluxions at all, we muſt come at laſt to conſider the Velocity it has at one Point. But what is moſt ſurpriſing of all, at the ſame Time that he is declaring againſt *Velocity*, he introduces *it* into his own Definition: For he has all the following different Ideas to put together to make the Definition of a Fluxion, *viz.* 1. Magnitude, that *wou'd be* generated. 2. A given Portion of Time. 3. Generating Celerity. 4. A certain propoſed Point or Inſtant. Out of all which ariſe a very ſtrange *complex* Idea! not at all proper to convey any proper Notion of the Thing defined: Whereas the Term *Velocity* cou'd have done it at *once*, without any Perplexity: For in the Generation of Lines, the Velocity of the deſcribing Point, is the very Fluxion itſelf, and nothing elſe. And in all other Quantities the Term Velocity is uſed analogically.

The Fluxions of all Quantities are Things really exiſting in *Rerum Natura*. But Magnitudes that *wou'd be* uniformly increaſed, do not really exiſt, except in Motions perfectly uniform: On the contrary, Velocity *really* exiſts at every Point of any Motion. Therefore Magnitudes that *wou'd be* deſcribed, are not really the Fluxions; and the moſt that can be ſaid of them is, that they are proportional to the Fluxions, and that the Fluxions may be *meaſured by them*; as the Author expreſsly ſays in Page 151, where he ſeems to have conſidered the Things more accurately.

In treating of the *Exponential*, p. 293, *John* falls again into great *Agonies*; and in his Hurry forgot to quote half the Sentence he is going to confute: But pray, *John*, where is it affirmed, that the Solution is perfect, though incapable of a particular Correction? On the contrary, you affirm the Quantity cannot be corrected without the Exponential; which I will venture to deny, till it be ſhewn me.

At p. 455, to prove that x comes to be $= \frac{f}{1+g}$, he refers us for the Proof of it two Pages further, which is an *Inſtance* of his *excellent* Method.

Laſtly, when he is told of aſſuming Mr. *Emerſon*'s Title, he falls into *Convulſions* again: But I have Orders to aſſure him, no extravagant Encomiums were ever beſtowed upon Mr. *Emerſon*, much leſs at Mr. *Simpſon*'s Expence, by the Perſons he imagines. Neither can I myſelf underſtand, without his Aſſiſtance, how that Gentleman can ſuffer in his Character, by ſending any Thing curious to the *Diary*. Neither is it any Thing to me what you or your Friends may think; but, for my Part, I think you might have been better imployed than in attempting to defend what you ſee cannot be defended, and expoſing the *little* Judgment you have to the *Laughter* of the Publick. And I am apt to believe, that your *Great Maſter*, when he comes to conſider what you have written, will hardly thank you for the *poor* Defence you have made; nor think you a fit *Champion* to engage in his Cauſe for the future; ſo, good Night, *John*.

An ANSWER *to the Objections in a* mathematical Collection *(lately dead) made to the* REMARKS *on Mr.* SIMPSON'S FLUXIONS, *by* Cantabrigienſis. *Firſt publiſhed in the* Monthly Review, *for* December 1750.

By Ẏ SECUNDUS.

SHEWING,

That the Author's *Definition of a Magnitude's* Fluxion, *already exiſting, by an indefinite* Increment *of that Magnitude, ſuppoſed to be hereafter deſcribed by the ſaid Magnitude's Fluxion or Velocity, uniformly continued, is a very great Impropriety and Contradiction.*

That, if the ſaid Author *or* Compiler *had properly called the ſaid uniform indefinite Increment of a Diſtance, ſuppos'd to be hereafter deſcribed by any Kind of Fluxion or Velocity, a Value relative of the Velocity deſcribing it (and not the very Value of Velocity itſelf) and conſidered it only with the Value of another Increaſe of Diſtance deſcribed with it, by another Diſtance's Velocity, uniformly continued, it had been but defining, at a Diſtance from the Subject, the* Ratio *of the ſaid Fluxions: Like explaining* 1 *and* 10 *Degrees of* Swiftneſs, *already exiſting at two certain Points of Diſtances paſſed over, by* 10 *and* 100, 100 *and* 1000, &c. *Miles hereafter* ſuppoſed *to be paſſed over, while the next Increments of Diſtances,* actually *paſſed over in Nature, are immediately connected with the Subject, and the Degrees of Motion or Fluxion enquired after.*

THE Remarks by *Cantabrigienſis*, on Mr. *Simpſon's* Fluxions, are miſrepreſented in the ſaid *Collection*, either by the *Compiler* of thoſe Fluxions, or his Advocate, or both. This the Reader will perceive, if he compares what *Cantabrigienſis* ſays in his Obſervations, by which *ſome Idea* of the Writer's Abilities, as to *Method*, *Conciſeneſs*, *Perſpicuity*, *Accuracy*, and *Judgment*, may be formed (*which is no Harm to ſay*) with what is ſo unjuſtly anſwered, that "the "Compiler was repreſented to have no Abilities, or "none of the ſaid Qualifications." The ſame Falſhoods are ſuggeſted, and actually advanced, with reſpect to other Particulars, the *Critic's* Meaning intirely perverted, and his Impartiality treated with *ill* Morals, Scandal, and Cavil for Argument.

If Books were not allow'd to be criticis'd, or remark'd, without Evil imputed to the *Critic*, or Remarker, what muſt become of Learning, when it happens to fall into the Hands of *Empirics*, and Pretenders to Science and Judgment?

And who can thoſe important Authors, or Compilers be, that ſhall diſallow of their Performances being remark'd, or even criticis'd, by thinking them *above* the Reach of other Mens Judgment, to find Fault with, eſpecially, as a Work once purchaſed, becomes the Owner's Property to treat with Juſtice as he pleaſes?

Nothing is publiſh'd but what is, more or leſs of it, compiled from other Men's Writings, or Judgments, and what has been done before on the ſame Subject. Every Age is beholden to former Generations for it's Improvements in Science and Literature: Then ſhall any Writer of *Yeſterday*, who expects to excel all Writers before him, be offended with a Writer of *To-day*, endeavouring to exceed what he has done, by pointing out his Errors? No Perſon, ſurely, can be thought unwelcome to criticiſe the *Ladies Diary* juſtly, as to the Errors, or Immoralities, in it, if any are contained, without Miſrepreſentation of the Compiler's Deſigns to the *Stationer's Company*, and playing knaviſh Tricks, the Author thereof is aſhamed to own, or appear to.

It is a *Maxim*, that every Perſon of *Genius* in a Science, has not always an equal Share of Judgment to conduct that *Genius*, in compiling what he knows in the beſt Manner for the Uſe of the Public. This may be the *Compiler's* Caſe under Conſideration, as well as the Caſe of many other Compilers. And herein the great Difference between Authors and Compilers conſiſts, in ſome knowing how to judge for the Public, in what is *moſt wanting and neceſſary*, and writing by that Rule much better than others.

The impartial Sentiments of *Cantabrigienſis* are called *injurious Reflections*; tho' Reflections only on a *little Character* in Science, without being injuriouſly immoral; but Scandal and ill Morals are produc'd to anſwer thoſe ſuppos'd, injurious Reflections, by the Father's and Godfather's Fondneſs for their *Child*, tho' ſprung from other Books, and Brains, more than their own.

The *Public* will judge of the Parts and Qualifications of this *incomparable* Infant (not to be ſpoken againſt) were ever ſo many Endeavours uſed to depreciate or commend it. The *Defects* of it were only pointed at for others to obſerve: And ſhall theſe Gentlemen expect, that all, beſides it's Friends and Relations, ſhall be compelled to utter its Praiſes, becauſe the Parent of it is a F. R. S. and the Sponſor for it's Qualifications *Direction*-Writer at the *Hand* and *Apple*, in *Queen-ſtreet*, *London*?

Or, ſhall any be afraid to criticiſe, becauſe the Parents known Aſſiſtants and Advocates have it in their Power to be immoral and ſcandalous?

It is clear to all *Judges*, from what has been advanced by *Cantabrigienſis*, that the Compiler of Mr. *Simpſon's* Fluxions has not ſhewn ſo much Judgment as might have been expected from a Work of that Price, ſold at Twelve Shillings, which is double the Price of Mr. *Emerſon's* Fluxions: Nor has he ſo *methodically* and *uſefully* treated a great many Subjects, as Mr. *Emerſon*, Mr. *Mac Laurin*, and other Writers of Fluxions, had done before him. He has gone *backward* and *forward* in treating the ſame Subject; and has neither given an *Index* Table, or *Table of Contents*, requiſite for finding what is contained in ſuch a *voluminous*

Work of 4 or 500 Pages; ſo that the Reader muſt ſpend great Part of his Time in vain, looking for what he wants.

It is evident, that the Compiler thereof has explain'd the *Effect* for the *Cauſe*, in his Definition of a Fluxion. For what is Magnitude, that *wou'd be* uniformly deſcribed to the Property of an actual Degree of Velocity, that he abſolutely defines for it, which is only relative compared with other Velocity? Without ſetting out with conſidering Motion as relative, and the Increment of Space he deſcribes for it, as being only the *Ratio* of that Motion, he ſays, "*The Magnitude by which any* "*flowing Quantity* wou'd be *uniformly increaſed in a given* "*Portion of Time, with the generating Celerity, at any* "*propos'd Poſition, or Inſtant, (was it from thence to con-*"*tinue invariable) is the Fluxion of the ſaid Quantity at* "*that Poſition, or Inſtant.*" Wherein he makes a Quantity of Magnitude (that would be relative to another Magnitude) to be the abſolute * Quantity of Velocity or Fluxion, pre-exiſting to that Quantity, and of another Nature.

The *Compiler* has no Right to vary from the *Inventor's* Definition of a Fluxion, to teach the Principles of an Art otherwiſe than Sir *Iſaac Newton* had done, unleſs he *could* have detected his Error of Judgment, and diſcover'd a better Definition. But it is plain he did not underſtand Sir *Iſaac* clearly on this Head, or he would not have falſly differed from him, by repreſenting relative Swiftneſs at a Point of Space already paſſed over by a ſuppos'd Increaſe of Space, afterwards to be moved over by that *very* Swiftneſs, uniformly continued for any Time: Which Diſtance is only to be relatively underſtood, as being in the *Ratio* of the ſaid Swiftneſs or Fluxion (comparatively conſidered with another Diſtance, deſcribed by another Fluxion) but cannot be the *abſolute* Swiftneſs, or Fluxion itſelf, as the Compiler has repreſented. By all which it appears, that his *Advocate* is equally in the Dark with himſelf, with reſpect to the *Doctrine and Application of Words*, and the proper Diſtinction that ought to be made by the Uſe of them; otherwiſe he would not have gone about to defend ſo defenceleſs a Cauſe, as to vindicate an Abſurdity, by repreſenting a Fluxion *to be of the ſame Kind with the Fluent*, uniformly generated; when the one is a Quantity of *actual Velocity*, and the other a Quantity of *Space*, deſcribed by that Velocity, which can be only proportional to it. He means, that the Increment of Space, in ſuch a Caſe, hereafter to be deſcribed, by the Fluent's Fluxion uniformly continued, will be of the ſame Kind with the Fluent already generated, which is granted to him: But then it follows, that this *Increment* of Space, afterwards deſcribed (which the Compiler calls the Fluxion of any Fluent, to which it is only an Increment) may be leſs than, equal to, or greater than that Fluent, according as it's Fluxion or Velocity is uniformly continued for a ſhorter or longer Time. And therefore, according to the *Definition* by our Compiler, a Fluxion will always be the Fluent, more than the Fluent, or Part thereof, in uniform Motions; and ſo it will happen in uniform Increments of Space, called Fluxions of Fluents by the Compiler, firſt deſcribed by variable Motion, *i. e.* in that Caſe, the Fluxion will be the Fluent, more than the Fluent, or Part thereof; and ſhews, that the Compiler's Fluxion is only the relative Value of a Magnitude, and proportional to the Fluxion, (as has been ſaid) and not the Value of the Velocity itſelf, as he repreſents.

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* *The Term* abſolute *is here us'd for* determinate Quantity, in reſpect of other certain Quantities, while Mr. *Simpſon*'s Increaſe (us'd for Velocity) is indefinite.

If this *uniform* and indefinite Increment of a Magnitude (defined for an abſolute Fluxion) that *wou'd be* deſcribed, be conſidered in the *Ratio* of the Fluxion of the already generated Fluent (the moſt advantageous Way that it can be conſidered) yet it will be all but an *imaginary* Hypotheſis, and foreign to the *true Idea* of a Fluxion, or *actual* Degree of Velocity, no where exiſting but at the Point of Space *already* deſcribed. All the *ſpecious Definitions* of a Fluxion in the World cannot alter the true Nature of that Degree of *inſtan-*

taneous Velocity, which is beſt underſtood and determined by the indefinitely ſmall Increments or Decrements of Space, next thoſe Points, or the Value of thoſe relative *inſtantaneous* Points, under certain, reſpective, and variable Swiftneſs, or Motion.

Cantabrigienſis plainly ſhews, that the *uniform* Increment, which the Compiler calls the Fluxion of a Magnitude before deſcribed, is but the *Effect* deſcribed for the *Cauſe*, as it certainly is no other: For each Fluent's variable *Fluxion*, or Velocity, exiſted before the uniform *Increment* that is ſuppoſed to be reſpectively deſcribed by it, commencing uniform from its Point of Generation; and the ſaid Increment being proportional to the Fluxion, tho' taken for the abſolute Value of it, can be but the *Effect* of what the Velocity or Fluxion produced; and therefore it ſhews the Compiler's, or his Advocate's Diſpoſition to cavil, when they have nothing juſtly to ſay.

If the Compiler builds thro' his whole Book, as his Advocate ſays he builds, upon his own Definition of a Fluxion (which is wrong, and ſo peculiarly diſtinct from that by Sir *Iſaac Newton)* his whole Fabric muſt be very tottering.

His Advocate's very angry and immoral Defence of what cannot be defended, by charging Aſperſions and Evil to the Critic, or Remarker, will certainly redound to neither of their Reputations.

Tho' the Advocate would make a *real Diſtance* (imagin'd to be deſcribed by the Fluent's Fluxion, ſuppos'd to be uniformly continued from any given Point) paſs upon us for that Fluent's Fluxion itſelf, pre-exiſting to that imaginary deſcribed Diſtance, he has not ſhewn that ſuch a Fluxion's *Reality*, as he gives an Account of, ever happens in Nature; yet the Compiler has dar'd to pronounce, that *ſuch Forms of Fluents* (with which their Fluxions are immediately connected) can *never happen in any Enquiry into Nature*, ſpeaking of the Authors he has excell'd! He was anſwer'd, by a ſuppos'd Judge of the Subject, “ There are many Forms happening by Enquiries into Nature, which neither he "nor any one elſe, has diſcovered". And his Modeſty, ſpokeh of, on this Occaſion, by *Cantabrigienſis*, has not yet been diſprov'd, or even contradicted.

His Advocate's introducing Time *paſt* and *future*, into an Argument about *Cauſe* and *Effect*, is foreign to the Purpoſe, and the Increaſe of Space by the Space's Velocity continued uniformly, is no more the Velocity itſelf, than the *Action* is the WILL, or *Thought*, which precedes it.

Let the Compiler's *Genius* and Abilities be what they will, in the Application of the Doctrine of Fluxions, it is unanimouſly agreed, that he has egregiouſly failed in his Definition of what a Fluxion is.

In $y = -\overline{cxxx+2ax+2aa}+dM^{\frac{x}{a}}$, the Compiler was told, that (tho' he propos'd to correct the Fluent by $dM^{\frac{x}{a}}$ for x to be $= o$ when $y = o$) there were infinite Caſes wherein x cannot be $= o$ when $y = o$, to which his Advocate, or himſelf only, anſwers, that x and y, in moſt Caſes, are alike; and inſtead of candidly acknowledging his Miſtake, or falſe Step here made, as might have been expected from an F. R. S. Ribaldry and Equivocation are offered to ſupport Error.

The Advocate does not clear the Compiler from the Imputation attending his aſſuming Mr. *Emerſon*'s Title to his Work of eſtabliſh'd Reputation, but pretends the Reception which his former Book of a different Title (called *Treatiſe*) met with, out of which the latter, called *Doctrine* and *Application*, aroſe, like a young *Phœnix*; and talks as if it were a Diſadvantage to alter his firſt Title, and that it look'd like Ingratitude to his Buyers, who, it ſeems, bought only to ſerve the Compiler, or to that Effect. But, if the *Treatiſe* met with ſuch deſired and deſerved Reception (*and none went to the Paſtry Cook's, or Trunk Maker's*) it ſeems unreaſonable, and Forgetfulneſs of Intereſt in him, to vary his Title ſo exactly like Mr. *Emerſon*'s *Doctrine*, which is a Book known to ſell. However upright or unintending the *Compiler's* Thoughts might be in this reſpect, yet certainly he was very uncareful to avoid the Appearance of an *Artifice*, like that which is uſed by ſome Bookſellers and Authors for putting off Mathematical, and other *Lumber*.

As to *Plagiariſm*, it might be aſk'd, Whether or no the *Prize-Queſtion* (concerning *Whitfield*) in the *Ladies Diary*, for 1750, is not inſerted and ſolv'd among the Compiler's other collected Problems? If he or his Advocate are conſiderable enough to loſe *mathematical Reputation* at the Degree talk'd of, by the *Encomiums* beſtowed on others, muſt *Cantabrigienſis* aſk Leave (for that Reaſon) on whom he ſhall beſtow his Sentiments of Approbation as he thinks due? Certainly I think not.

Every Gentleman of Science is at Liberty to cultivate Friendſhip or Acquaintance with another, for the Improvement of himſelf and Science: And does not this Obſervation look *invidious* of a F. R. S. or his Advocate, not diſpoſed to be communicative but for Intereſt, or ſervile Adulation! eſpecially when it is known, that the Compiler here ſpoken of publiſhes nothing, but by the Aſſiſtance of others? Why, then, does he, or his Advocate, make Objection to *one Perſon* being incapable of writing the *Diary* and *Palladium*, querying if his Opinion for it has ſufficient Foundation, at the ſame Time? And why does he cringe to ſuperior Merit, to overlook his Weakneſs? As if *Ignorance*, *Miſtake*, or *Error*, were to eſcape Notice, or be tolerated for Complaiſance.

To the Family of the WOU'D-BE'S.

H*OW! is th'* Offender *and th'* Offence *the ſame?*
Is Will *the* Action? *Have they but* one *Name?*
If, the ſwift *Ball, you* Death *itſelf allow,*
Shall Death *be puniſh'd, if the Cauſe be* you?
How ſhall we judge betwixt the Blow, and Hand
Compell'd to act, if not by Self-Command?
Pow'r is the Cauſe whence Villanies proceed,
As conſcious Worth directs each noble Deed!
If you tranſpoſe, and vary Nature's Laws,
Then Speed *is* Diſtance, *and* Effect *the* Cauſe;
But Bodies, *paſſing o'er th' ætherial Plain,*
Their Pow'r *to move, and* Diſtance *mov'd, maintain.*

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ANIMADVERSIONS
ON
Mr. Simpſon's FLUXIONS.

By Ż TERTIUS.

THE Author had ſhewn more *Invention* and *Candour*, had he not transform'd his old Title of *Treatiſe*, to a Title ſo exactly like Mr. *Emerſon*'s, to a *Work*, of eſtabliſhed Reputation, on the Subject, ſold for 6 *s.* only. Had he call'd his *Book* THE DOCTRINE and APPLICATION of the INCREMENTS of MAGNITUDES that WOU'D BE deſcribed by their *Fluxions*, uniformly continued, the relative Values whereof (by a *new Improvement* in the THEORY of Fluxions) are ſubſtituted for the *Values* of the Fluxions of *Magnitudes*, &c. it had been leſs liable to Exception. This *en paſſant*.

Notwithſtanding his "*mature Conſideration and Judgment*," acknowledg'd in the *Preface*, he has given us a *falſe Idea* of the *Nature* of Fluxions, or has confounded the *Idea*; firſt, by conſidering a Fluxion or *Velocity* as merely abſolute, and not comparative; and next, by defining that *Fluxion*, or Degree of Velocity, to be the Increment of a Magnitude that *wou'd be* deſcrib'd by a Magnitude's Motion, uniformly continued, from a given Poſition, and not *as* the *Value* of another Increment of Magnitude deſcribed with it; the calling which Fluxion a Magnitude, ſo deſcrib'd, or one Thing by the Name of another, is as great an Impropriety (*the Author muſt excuſe me*) as if he had call'd his Book himſelf, becauſe he was the *principal* Agent in the Cauſe of it.

The Author, at firſt, talks of *Fluxion* as Motion, (which *it is*) but contradicts himſelf at Page 6, of his Preface, where he deſcribes Fluxions, *not as the Velocities themſelves, but the Magnitudes* they *wou'd uniformly generate in a given Time*, for an advantageous Way of conſidering them, tho' not for what they are. In the next *Page* he ſeems to bring the Reality of Motion into Doubt, as it was brought by the ancient *Sceptics*, *(tho' as evident as Life, or conſcious Perception)* who loſt themſelves by not conſidering Motion comparative, as all Things are.

At Page 4, of his Book, the Author comes to conſider Fluxions, or the Increments of Magnitudes put for them, that *wou'd be* deſcribed, as comparative; but neglects to define thoſe Fluxions *as* the relative Values, or *Ratio*, of thoſe Increments he deſcribes for them; to which his Book *ſhould be* corrected: For *Fluxions are actually the comparative Velocities with which relative Spaces, or Magnitudes, equal in Value thereto, are deſcribed together*, and not the *Increments* of Magnitudes themſelves, according to Mr. *Simpſon*'s Account: Which *Idea* given, by the beſt Conſtruction, is as odd as if 10 and 100 Miles, yet to be travelled over, *&c.* were deſcribed for 1 and 10 Degrees of *Swiftneſs* already exiſting at any two inſtantaneous Points.

As to what the Author objects in his *Preface*, that by taking Fluxions for *meer Velocities* (tho' they are no other) the Imagination is confined to a *Point*, wherein all the infinite Changes and Affections of Motion, the higher Order of Fluxions, have not, as he thinks, the Advantage, as by " his Way of conceiving and explaining the *Matter*,"—it is obſerved, that when the Increments of Magnitudes he deſcribes as hereafter, for their Fluxions or Velocities already exiſting, are *arriv'd at* by the Magnitude's Motion, ſuppos'd to be uniformly continued for any Time, as ſoon as a Change thereof happens, at the *Point* of its becoming variable, there will ſtill ariſe the ſame metaphyſical Difficulty of conceiving the *new Velocities*, as at firſt, in the true Way of conſidering Fluxions; when the *Imagination* will ſtill be confined to the Difficulties of a Point, (complained of by Mr. *Simpſon*) where all the Affections and Variations of Velocity are to be conſidered in *Cauſe* and Power; like what is done in the Mind, and not as the Actions produced by *Cogitation*, and the *Will*, preceding thoſe Actions. And the higher Orders of Fluxions, Page 14, explained by his Friend's Method, have every one of their *variable* Velocities in the Point B, at the End of the firſt Line; from whence the reſpective variable Diſtances, C D, E F, G H, repreſenting thoſe Changes in Succeſſion, are ſuppoſed to ariſe. And here the Author conſiders, not each variable Diſtance, or Increment of Magnitudes, as relative to other Variation of incremental Diſtance with it, when he ſays, the Diſtance C D, *&c.* the Meaſure of Celerity, (*where he begins to talk of numerical Value*) muſt alſo vary, for the Celerity to vary; for that variable Diſtance can ſhew no *Change*, but by relation to other incremental Diſtance deſcribed with it, not here obſerved.

I can ſee no ſingle new Improvement made in the *Theory*, (tho' many are talk'd of under the borrowed Title) but the Principles rather involv'd in Obſcurity and Error, by repreſenting a Magnitude's abſolute Velocity, or Fluxion, to be an *Increment* uniformly deſcribed by it, *leſs* than, *equal* to, or *greater* than, the Fluxion's *Magnitude*, of which it is an Increment, which can be only of numerical relative Value to the ſaid Fluxion, while the *next Increments* of Quantities are the immediate *Effects* connected with the true relative *Cauſes*, which are the *Fluxions*.

That a Book of 576 Pages, in *two* Parts, without either *Index*, or Table of *Contents*, ſold for 12 s. "ſhould ſerve the Purpoſe of Beginners, whoſe *Eaſe* "*and Benefit*", according to the Words of the Preface, "have been particularly conſidered by the Au- "thor", is not underſtood. And how theſe *Inaccuracies* obſerved, ſo obvious to every Perſon barely acquainted with the *Rudiments* of Fluxions, will have *due Weight with his* NOBLE PATRON's *exact and ſolid Judgment*, is much to be doubted.

I have obſerved what is ſaid of Mr. *Simpſon*, and his Fluxions, in the *French* Magazine, for *December*, 1750, printed at *London*. The Author's Merit and Fortune are there imperfectly told, being bred a *Stuff-Weaver*, and not to the Silk Manufactory, at *Market-Boſworth*, in *Leiceſterſhire*, the Place of his Nativity, and afterwards aſcended to the Dignity of Under-Profeſſor in the *Artillery-School* at *Woolwich*, F.R.S. The Story proceeds to ſhew his Book of Fluxions was transform'd from a meaner Performance to the *excellent Work* it is here deſcribed for, being contraſted with Mr. *Mac Laurin's*, and all other Books of the Subject ever yet publiſhed; all which it is repreſented to excel, Sir *Iſaac Newton's* Fluxions not excepted; the Reaſon of which, by the due *marſhalling* of the Words, may be readily diſcerned, without the piercing Sight of an *Eagle*, or Symbols and Calculations *turned over* to find out: And we might alſo add, that this Book excells all the Books on the Subject, that ever will be publiſhed.

However, the *French* Panegyriſt ſeems not to be a Judge of the Performance; for he neither points out the Beauties or Deformities of it. *See Obſervations in the* Monthly Review, *for* December, 1750, *on the ſame Book*, by *Cantabrigienſis*, reprinted farther on.

Mr. *Landen* objects to the Definition of Fluxions “ as *faulty*, by the Author's different *Idea* given of them to that by their *Inventor*”. And talks of “ denoting all Quantities whatſoever by Lines, to bring them to one Denomination” *(which, by the bye, only denote the numerical Values of Quantities as Magnitudes)* “ and thoſe Lines, to be deſcribed by Bodies in Motion, when the Velocities, relatively conſidered, at any Poſition, will be what are called the Fluxions of thoſe Quantities, and the Diſtances deſcribed thereby the *Fluents* of thoſe Fluxions. The Buſineſs of the Doctrine of Fluxions is from the Relation of the Velocities of Bodies in Motion to find the Relation of the Spaces paſſed over together: And, on the contrary, having the Relation of Spaces paſt over together by Bodies in Motion, to find the Relation of their

“ Velocities ; which properly belongs to the Doctrine
“ of Motion to determine : The whole of which may
“ be managed by common *Algebra*, without the leaſt
“ Obſcurity.

“ The Buſineſs had always been better conſidered in
“ that Light, without ever making Uſe of the Term
“ *Fluxions*, as if a new Kind of *Analyſis*, tho’, in *Fact*,
“ only the *Doctrine of Motion* improved, and applied
“ to Purpoſes before unthought of.”

J. Landen.

This is Sir *Iſaac Newton*’s general way of conſidering Fluxions, who adapted the Term *Fluxions* (here found *Fault* with) to the *particular* Deſcription of the three geometrical Magnitudes, *Line*, *Surface*, and *Solid*, by the Motion of a relative Point and Point, Point and Line, Point and Surface, *as* the numerical *Swiftneſs* of Increaſe of its Altitude, at the Extreme of their *Axis*, to the numerical Swiftneſs of their whole Increaſe, at their reſpective *Baſes*, in order to get rid of the *Inaccuracy* of ſuppoſing any of the three Sorts of Magnitudes conſtituted by indefinitely ſmall *Increments*, or *Differentials* (ſtill infinitely diviſible) the Doctrine of Foreigners. And here it may be noted, that the moving *Point* on the *Axis* is always conſidered in numerical Value as 1, to the Value of the moving *Extreme* of each *whole* Magnitude : Yet in a numerical Increaſe, by the Motion of theſe *relative Extremes* of Magnitudes, the numerical Values of the Increments of Quantities, again decreaſing, continually approach the Value of thoſe Extremes (like $\frac{1}{1000}$, &c. to 0) but never can accurately converge to them.

Hence Mr. *Simpſon* had no Occaſion to make the *Annotation* he did at P. 5 of his Fluxions, ſeeing that all *algebraic* Quantities, or *Lines*, repreſenting the Values of Magnitudes, and alſo their Fluxions, are *only numerically* comparative, as to their *Values* ; for the numerical Values $\dot{x}$ and $2x\dot{x}$ are the Fluxions of x and xx, *algebraic* Quantities, or of *Lines* denoting the numerical Values of Magnitudes, where a *Line and Surface*

face are ſeen to be numerically comparative: As are likewiſe all Things and Qualities in Nature.

$\dot{Z}$

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The REMARKS *by* Cantabrigienſis, *on Mr.* Simpſon's *late* Doctrine *and* Application *of* FLUXIONS, *firſt printed in the* Monthly REVIEW, *for* December, 1750; *giving Riſe to the preſent Controverſy about the Truth here recited, to ſatisfy the Reader of the* Remarker's *Juſtice. We ſhould likewiſe have inſerted* John Turner's *Obſervations thereon, had he kept to Truth or Decency, or even to Probability.*

1. AS a methodical *Criticiſm* on Mr. *Simpſon*'s late Doctrine of Fluxions wou'd take up as much Room as might ſuffice for a *competent Treatiſe* on the Subject, I ſhall only offer you a *few general Obſervations* thereon; from which ſome *Idea* of that Performance, and likewiſe of the Writer's Abilities, with regard to *Method*, *Conciſeneſs*, *Perſpicuity*, *Accuracy*, and *Judgment*, may be form'd.

2. The Largeneſs of the Work, and the Confuſion with which many Things are therein treated, require more *Time* and *Patience* to conſider, than even *Judges* can afford to lay out; but to the *Learner*, are inſuperable Difficulties to his Improvement.

3. I find, that theſe Volumes contain the Subſtance of Mr. *Simpſon*'s firſt *Book of Fluxions*, (called his *Treatiſe*) and his mathematical *Eſſays*; to which he has added ſeveral *new* Problems, and ſome Things are Copies out of late Writers; but I can find little or *nothing new in them beſides*.

4. The *Definition* he gives of Fluxions is very *odd.* He ſays, it is "*Magnitude by which any flowing Quantity* wou'd be *uniformly* increaſed". From which I make theſe Obſervations: That in Quantities *uniformly* generated, the *Fluxion* muſt be the *Fluent itſelf*, or elſe a *Part* of it. And, in other Quantities generated by any *variable Law*, the *Fluxion*, according to him, will not be a *real*, but only an *imaginary* Thing. Likewiſe his Definition (*in which he pretends to exclude Velocity*) cannot be made intelligible, without introducing Velocity into it.

5. Again, he miſtakes the *Effect* for the *Cauſe*; for the Thing generated muſt owe it's Exiſtence to ſomething, and this can only be the Velocity of its Motion; but it can never be the *Cauſe of itſelf*, as his Definition wou'd erroneouſly ſuggeſt: And, by the Way, one wou'd wonder how it comes to paſs, that after all the elaborate Performances written on this Head, our Author ſhould ſtill ſtick in the *Mud*, and run himſelf into the old exploded Method uſed by Foreigners, and which is ſubject to all the *Cavils* that have ever been raiſed againſt the Science, and which he muſt neceſſarily incur, whilſt he is endeavouring to avoid them.

6. As to what he ſays in his Preface againſt Sir *Iſaac Newton*'s uſing the Word *Velocity*, 'tis mere idle *Stuff*, and deſerves no Anſwer, and only proves, that the Author underſtood nothing at all of what Sir *Iſaac* was writing about.

7. And as to what he ſays in reſpect to the *Goodneſs* of the Method he has taken, and the *improper* Method of ſome other Authors, he muſt leave other People to judge of that. But it ſeems more natural to lay down the *Principles* firſt, and then deduce the *Practice*, than to run backwards and forwards in the Book, from *one* to the *other*, without any Order or Method. And it muſt be exceeding troubleſome to *hunt* up and down in a Work of 5 or 600 Pages, without a Table of Contents, to find a *Rule*, when placed at *Random*.

8. He farther ſays, that there are Numbers of *Forms* of *Fluxions* laid down by Authors, which he dares pro-

nounce "*can never ariſe in any Enquiry into Nature.*" But this is what he does not know, and therefore is a Piece of *Vanity* and Preſumption in him: On the contrary, there are innumerable Forms of Fluxions ariſing by Enquiries into Nature, that neither he nor any one elſe has laid down. But it ſeems as if he wants no Body to write about any Thing but himſelf.

9. As to his aſſuming *that Title* *, I ſuppoſe it was done to give his Book a *Character*, and make it ſell.

10. In *Section* I. of *Part* II. he lays down the Proportions of the Fluxions of the Sides and Angles of *ſpherical* Triangles, but meddles not with plain ones. This is all taken from Mr. *Cotes*'s *Eſtimatio Errorum*, where it is elegantly demonſtrated.

11. In P. 293, this fluxionary Equation is given $cx^2\dot{x}+y\dot{x}=a\dot{y}$, and the *Fluent* is found $y=c\times\overline{x^2+2ax+2aa}+dM^{\frac{x}{a}}$. Here the Author ſays, $dM^{\frac{x}{a}}$ ſerves to correct the *Fluent*, which cannot, without it, be corrected in the uſual Way, ſo as to give $x=o$, when $y=o$. But if the Fluxion of this Quantity, without the *Exponential*, produces the fluxional Equation, then certainly this Quantity is not neceſſary: For there are infinite Numbers of Caſes wherein x cannot be $=o$, when $y=o$; but the *Reſult* will be according as the Nature of the Problem directs.

12. In the *ninth Section* there are ſeveral Problems that are very *obſcure* and *intricate*; particularly Page 455. How comes $x=\frac{f}{1+g}$, and from thence the Fluxion to be *transform'd* into *that* he gives us.

13. In *Section* XI. are ſeveral *Problems* which don't at all belong to *Fluxions*; and the like in ſeveral other Parts of the Book.

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* *Doctrine and Application of Fluxions* (*in* 8*vo. Price* 12*s. printed for* Nourſe) *being Mr.* Emerſon's *Title to a* Treatiſe of his *on this Subject; ſold at* 6*s. only, by* R. Manby, *and* H. S. Cox, Ludgate-hill.

Theſe are the Obſervations I have made, and doubtleſs any Body, that has Time and Patience, may find many more.

CANTABRIGIENSIS.

Nov. 5, 1750.

Being poſſeſſed of the *Remarker's* original Letter, we have ſupplied a few Wodrs left out in the ſaid *Review.* And we think fair *criticizing* a Benefit to Science and Literature, being like the true Touch-ſtone to Gold.

N. B. *We ſhou'd have printed* John Turner's *Anſwer, had it been free from Falſhood, Scandal, and worth the Reader's Peruſal.*

Note, *In Page* 20, *for the* French Magazine *of* December, *read* November.

ANIMADVERSION *on* MOTION.

MOTION is properly diſtinguiſhed into *Power and Effect of Motion*, or Impulſe, and Action of Motion; that is, the Quantity of *Power* which a *Body* exerts to move on, at any one *Point* of Space, before the next Space mov'd over, as the *Cauſe* which precedes the following *Effect* of that Body, continually moving over Succeſſion of Diſtances, from Place to Place. Theſe Affections of Motion, being as different as the *Thoughts* and *Actions* that ſucceed them; ought therefore to be as carefully diſtinguiſhed.

In order to judge of the *Power or Impulſe of Motion* (which is relative at any Time and Place of Exertion) we muſt compare it's ſucceeding relative Effects of Space mov'd over, with which it is immediately, or diſtantly, connected.

Motion of any kind is known but by Bodies changing their Places in certain Time, without which there could be no Motion; as without Motion (internal or external) there cou'd be no Time.

All Kind of Motion in *Power* (variable and uniform) at any *Inſtant*, refers to ſome *Standard uniform Motion*, by which, in *Effects* of Space mov'd over, it is meaſured and compar'd, being in the firſt Proportion, to which the very ſmall Diſtances or Increaſes of Space, reſpectively mov'd over, in the *ſame* ſmall Part of Time, continually *converge*, being again diminiſhed: But if the Motion to be meaſured is uniform, but ſwifter or ſlower than the ſaid Standard uniform Motion, then the Quantity of a Motion in *Power*, every where (*called Velocity*) at all Diſtances, or Increaſes of Spaces, paſſed over, will be accurately in Proportion as thoſe very Diſtances, or Increaſes of Space, paſſed over, in any the ſame Time, from the Beginning of Motion, or any ſucceeding Continuation thereof.

If continual *Change of Motion* is admitted, the Motion of any firſt Change, or Power of Variation, will be in the firſt Proportion to which the very ſmall *Increaſes* of the ſaid firſt Proportion, in Space mov'd over, in the ſame very ſmall Part of Time, continually *converge*. Firſt Proportion of Motions of Motions, are called Fluxions of Fluxions, or ſecond Fluxion of Quantities, or Spaces paſſed over: This *Motion* being ſtill continually changing, takes the Name of *Fluxions of Fluxions of Fluxions*, &c. or 3d, 4th, &c. Fluxions, *ad infinitum*, being in the firſt Proportion of the very ſmall *Increaſes* mov'd over, in the ſame ſmall Part of Time, of the Proportion repreſenting the former Order of Fluxions.

Hence it appears, that all the *different Powers* of variable Motion, exerting to *Action*, exiſt, in one and the ſame *Point* of Space, from whence each of their *Effects* immediately proceed, by an Increment of an Increment, *ad infinitum*.

HELIOCENTRICUS.

Of

Of the USE *of the* ALGEBRAIC CYPHER, *in finding the Fluxions of Algebraic Quantities.*

o is not properly affected with + and —, but may be negatively, or poſitively, uſed to find the *Ratios* of the Fluxions of algebraic Quantities; being as the moving *Surface*, *Line*, or *Point*, with their reſpective relative Unit, deſcribing geometrical paces: Next to the Value of which *Surface*, *Line*, and *Point* of *o* Thickneſs, Breadth, *&c.* are the Values of the indefinitely ſmall Increments, or Decrements of Magnitudes, *numerically* repreſented, and conſidered as variable; which are the neareſt Meaſures of the ſaid Fluxions, *i. e.* of their very *Ratios*.

Thus when algebraic Value or Length x, *algebraically* encreaſes or decreaſes, and becomes $x \pm o$, x^2 will *algebraically* become $x^2 \pm 2xo + oo$, whoſe *algebraic* Increments or Decrements are ſeen to be $\pm o$ and $\pm 2xo + oo$ produced together; dividing by algebraic o, we have ± 1 to $\pm 2x + o$, the Ratio of the algebraic Increments or Decrements, in whatever Value o is conſidered. But, now, algebraically conſidering o of inſenſible *Value*, as before it was conſider'd of real ſenſible Value, the ſaid *Ratio* then becomes 1 to $2x$, as $\dot{x}$ to $2x\dot{x}$ for the *Ratio* of the Fluxion of x and xx; and the *Ratio* of all other *algebraic* Quantities, (which are numerical Quantities) are ſimply determined in the like Manner.

This *algebraic Ratio* of the Fluxions of Quantities, to which the *diminiſhing* Value of the *algebraic* Increments or Decrements, from their limited State or Value, tend together, to their geometrical vaniſhing (*by ſuppoſing the variable Value leſs and leſs*) has been miſconceived, as vaniſhing together with the *real* geometrical Increments or Decrements they are the *Value of*;

whence *o* has been denominated a *departed*, inſtead of an *algebraic* Quantity, by a famous B—p, tho' it's Reality and Preſence ſtill exiſted before his Eyes; but if *o*, the Cypher-Value, or *algebraic* Quantity, call'd alſo *Nothing*, be made to ſignify *Nothing*, becauſe it is ſo call'd, the Word *Nothing*, with as much Propriety, may be called *no Word*, be allowed to have no Signification among other Words, and be deem'd a mere Blank, as *no* Subject capable of Conſideration.

As to $x - \overline{\tfrac{1}{x}}\big|^{\frac{1}{x}} \times x = y$ produc'd by Mr. *Landen*, to ſhew the fruitleſs Uſe of *o*, as an *algebraic* Quantity, when *x* becomes infinite (which is never) $\frac{1}{x}$ which he then makes $= o$, we find only of *indefinite ſmall Value*, and therefore $\overline{\tfrac{1}{x}}\big|^{\frac{1}{x}}$ will be always leſs than 1, conſequently *y* will never be $\overline{1 - o}^{\,o} \times x = o \times x = o$. But 1,— a leſſer Quantity $\times x$, indefinite, will become greater and greater, as the Value of *x* increaſes. By the Fallacy of Mr. *Landen*'s Word Infinite, we did not at firſt diſcern the Truth. But as the Fluxion of $x - \overline{\tfrac{1}{x}}\big|^{\frac{1}{x}} \times x \left(= x - x^{\frac{x+1}{x}} \right)$ made $= o$, reduces to $x^{\frac{x+1}{x}} = X + x - 1$, we judg'd *y* to have a *Maximum*, which we find otherwiſe, by the Equation being impoſſible; for $x^{\frac{x+1}{x}}$ (according to Mr. *Landen*) is greater than $X + x$, and by Reduction $\frac{X}{x}$ greater than Hyp. L. $1 + \frac{X}{x}$, which is evident.

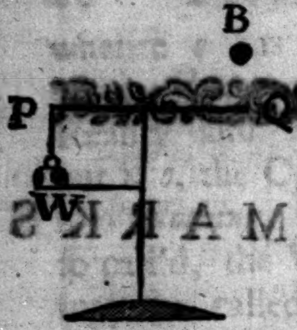
AMICUS.

Mr. LANDEN's REMARKS
ON
Modern PHILOSOPHERS.

'Tis hard to ſay, if greater Want of Skill
Appear in Writing, or in Judging ill. POPE's Criticiſm.

MR. *Landen* now denies the Compariſon of the *Force* of unſuſpended Weight at reſt, with the Force of a Body in Motion, maintained at Page 46, *Ladies Diary* 1751, where he admits, "*That* 1100 "*Grains deſcending one Fourth of a Foot, acquires a* "*Force capable of raiſing, or equipoizing, for a Mo-* "*ment*, 4660 *Grains Weight unſuſpended, and at reſt*": For which Miſtake he alledges his Inexperience at that Time, tho' comparing the Force of leſs Matter in Motion with the Force of *more* Matter at reſt, was merely experimental, requiring how far the leſs Quantity muſt deſcend to equipoize, or raiſe more Matter at Reſt.

The experimental Philoſophers, Mr. *Landen* ſays, "have advanc'd, That there is an aſſignable Height, "from which a *Body* falling upon one End of a *Bal-* "*lance*, ſhall not raiſe to the Height of $\frac{1}{8}$, or $\frac{1}{10}$ of "an Inch, the $\frac{1}{2}$, $\frac{1}{4}$, *&c.* of its own Weight, append- "ing to the other End;" — which he calls abſurd, and thus proceeds to prove it, *againſt Experience*.



According to the Experiments of our *modern* Philoſophers, when from any Heighth x, a Body B, falls upon one End of a Ballance, Q, to whoſe other End, P, the Weight W is hung, and kept from deſcending by a *Reſt*, but at Liberty to riſe immediately upon B giving an impulſe at Q (the Beam P Q being at firſt parallel to the Horizon, and the Weight W raiſed but a ſmall Height, h, by B falling on Q) B, while it acts on Q, may be conſidered as acting at right Angles to P Q. And if s be put for 32.2 Feet, the Velocity acquir'd in one Second, by a Body deſcending freely, the Weight W will begin to riſe with the Velocity $\frac{\mathrm{B}\times\overline{2sx}|^{\frac{1}{2}}}{\mathrm{W}+\mathrm{B}}$, per Second [*drawn from Experiment, while the Truth of Experiment is denied*] And the Moment it begins to riſe, it is acted upon by the motive Force $s\times\overline{\mathrm{W}-\mathrm{B}}$ [*drawn from Experiment*] to bring it down again, which drawn into $\frac{\dot{h}}{v}$, the Fluxion of the Time (v being the Velocity of W at any Inſtant of Time whilſt riſing) we have $s\times\overline{\mathrm{W}-\mathrm{B}}\times\frac{\dot{h}}{v}=-\dot{v}\times\overline{\mathrm{W}+\mathrm{B}}$.

Therefore $s\times\frac{\mathrm{W}-\mathrm{B}}{\mathrm{W}+\mathrm{B}}\times h=\frac{\mathrm{B}^2sx}{\overline{\mathrm{W}+\mathrm{B}}|^2}-\frac{1}{2}v^2$, when the Fluents are properly corrected [*Here the Value of h Feet is experimentally drawn from* $s = 32$, 2 *Feet*] Whence taking $v=0$, we have $x=\frac{\overline{\mathrm{W}^2-\mathrm{B}^2}\times h}{\mathrm{B}^2}$, the Heighth from which B muſt deſcend to raiſe W to the Height *h*. [*But how can that be generally true, when* B *is ſuppoſed to act at right Angles with the Beam while the Force acts*] By which it appears, that *x is not* *as the Square of* W Feet (*b* and *B* being given Quantities) as it is aſſerted by our modern Philoſopher (*ſee* Graveſande, Helſham, *&c.*) but only when B is ſmall in Compariſon with W, then x is nearly as W^2, and therefore I imagine it was that *Nearneſs* in a particular Caſe, which deceived thoſe Gentlemen.

Hence it is eaſy to obſerve, that no *regular Compariſon* * can be made [*why then is* $x =$ *as above?*] by ſuch Experiments of the Force of Body in Motion, and that of a ſuſpended Weight.

J. LANDEN.

ANNOTATION *and* QUERY *by* AMICUS.

BUT ſurely the experienced Tenſion by Gravity of ſo much Matter at Reſt, (being not in Equilibrio) anſwers to ſo much experienced Force, or Velocity of a leſs Quantity of Matter in Motion, near the Earth's Surface, and muſt have a proportional momentary Effect, reſpectively acting upon equal Power of Reſiſtance; *or elſe what is experimentally ſhewn for Fact, by Dr.* Deſaguliers, *and others, muſt be denied, and tried* Fact *ſtand for nothing; tho' it is evident there can be no Compariſon, or Proportion, between the Force of a Body at Reſt, in* Equilibrio, *being ever ſo great, and a Body ever ſo ſmall, unſuſpended, without any Degree of Velocity; and for that Reaſon the leaſt Particle of Matter, moving with an* indefinitely *great Velocity, may be equal to any* Force; *as is inſtanced in the Power of Lightning; being always as the Quantity of Matter multiplied into its Degree of Velocity.* A Doctor of Phyſic pretended to cure a Diſeaſe by Extraction of the

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* *A Line and Surface are only* numerically *compared, as* x *and* xx *and their Fluxions* $\dot{x}$ *and* $2x\dot{x}$; *and therefore why not Preſſure and Percuſſion, by Gravity? What* Newtonienſis *obſerves,* p. 46 *of the Diary,* 1751, *was miſunderſtood by the Commentator: Query.*

Square Root, and determining the Diameters of the Blood Veſſels, as alſo the Size of the *Blood* Globules, adapting his Remedies thereto; while the *tried Effect* of Medicines, and not their Philoſophy (as little known as the ſecret Powers of Attraction) anſwers the Intention of Cure.

AMICUS.

Of PRESSURE *and* PERCUSSION.

A Greater Body, at Reſt, of ſo much Matter, or Weight, by Gravitation (known but by it's Suſpenſion in *Equilibrio*) evidently requires a *certain* Degree of Velocity in a leſſer Body, for it to acquire an equal or ſuperior Force, by Gravity, to be capable of poizing that greater Body for an Inſtant, or ſhort Time; thoſe Forces being actually applied at contrary Ends of the ſame Ballance *(in the Manner ſhewn by the preceding Figure)* ſo as to act in contrary Direction.

The acquir'd abſolute Force of Matter, moving with a certain Degree of Velocity, is known but from Experiment only; whether in *accelerated* Velocity by Gravitation, or impelled uniform Motion, in a right Line: And a Cannon of 12 Feet long, weighing 6400 *lb.* gives a Ball of 24 *lb.* an uniform Velocity of 640 Feet *per* Second, according to *Merſennus*.

The *different* Effect of the Force of *leſs* Matter, moving with very great Velocity (by Deſcent of Gravity, or a Ball ſhot from a Muſquet) from that of more Matter, which it would poize, or raiſe up to a given Height, acting on the ſame Surface of Matter at Reſt, or in leſs Motion, by *Stroke* and *Preſſure*, proceeds from the Refrangibility of Matter, by other Matter in more Motion: For if Matters were alike irrefrangible, and impenetrable, the Effect of the Stroke of leſs, and that of the Preſſure of more Matter, (on the ſame Quantity of Surface) *wou'd be* alike for a Moment, or proportional for a ſhort Duration.

Experience ſhews, that a ſoft Subſtance being ſhot from a *Muſquet*, will, by it's Velocity, penetrate thro' a thick and hard Board; and that the ſofteſt and lighteſt Subſtances, put into very great Velocities, by *Lightning* or *Gunpowder* (whoſe Effects are amazing!) will penetrate the hardeſt Subſtances in Nature.

The *exploſive* Force of Gunpowder, adjuſted in Quantity, will raiſe a *Ball* of a given Weight to a given Height, within the Limits of it's known Force, being ſhot perpendicularly upwards; in which, the Compariſon between the Weight of Powder commencing Velocity, and the Weight of the Ball at Reſt, to which, by Stroke, it communicates the Motion, is evident.

An uniform *Pillar* of Stone, or other Matter (of given Dimenſions) ſtanding upon one End, on the Ground, requires certain Degree of Preſſure, above the Middle, to make it fall: And if a *Ball* were ſhot from a Muſquet, with ſufficient Force of Powder, to ſtrike the Pillar with the ſame, or more Force, at the Place of Preſſure, and in the ſame Direction *(not to penetrate)* wou'd it not alſo make the Pillar fall? And may not Force, by *Preſſure* and *Percuſſion*, herein be compared, againſt what has been ſo particularly advanc'd?

A *Cube* of any heavy Subſtance, of given Dimenſions, being laid upon one End of a ſmooth horizontal Plane, will require certain *Preſſure* to drive it off, or certain Weight ſuſpended from it by a fixed Cord, to draw it off the Plane; will not, therefore, a leſs Body than the ſaid *Cube*, thrown with Velocity againſt it, upon the ſaid Plane, have the ſame Effect, in compelling the Cube to fall off? Or, will not a Body of much leſs Weight, deſcending from a conſiderable Height, on an inclin'd Plane, ſo as to fall on the level Plane, and ſtrike hard againſt the Cube, force it off likewiſe? And may not Preſſure and Percuſſion therein be compared?

Could a *Ship* ſtem the Water, but by Velocity of the Wind, conſtantly ſtriking, with certain Force, againſt the *Sails*, and overcoming the Force of Reſiſtance (or *Preſſure*) between the Water, Ship's Surface, and the Gravity, wherein Force by Velocity of ſailing, and Preſſure by Reſiſtance, are proportional?

Are not the Force of *Preſſure* and *Percuſſion* compared between the *Stroke* that drives the Wedge, and the Wedge that gradually cleaves the *Block*? Or between the *Stroke* on the Wedge that preſſes, being driven in the Preſs, or the ſuſpended Weights at each End of the Croſs-Piece laid thereon, anſwering the ſame Purpoſe?

Action and *Re-action* being always equal between impinging Bodies, the Quantity of Motion generated by one Body, is deſtroyed by it's Stroke on another; and yet *momentary* Force may be compared with that of *durable*; and as the moſt imminent Dangers *actually* arrive by *Velocity*, and not by what *wou'd be* in vain to *ſuppoſe*, Velocity cannot be too well underſtood, or too cautiouſly avoided: For *Momentum* of Velocity is no more real *Magnitude*, than *Percuſſion* is *Preſſure*, tho' they are analogically underſtood in particular Inſtances.

SLEDGELY ANVIL.

OBJECTIONS *and* QUERIES *concerning the Nature of Motion, or Fluxion.*

AS no Time can be intellectually conſidered, but what has Time immediately preceding and ſucceeding it, 1. *Whether* what is called the preſent *Inſtant* is not ſome *indefinitely* ſmall Part of Time? And, ſince Motion of all Bodies is known but by their Change of Place, and any the leaſt real Diſtance require *ſome* Time in which it may be gone over? 2. *Whether* there can be any ſuch Thing as *real Motion* in *no* Time, conſider'd, for any *one* Point of intermediate Space gone over; eſpecially ſince an infinite Number of Points can never actually conſtitute real Magnitude? And, 3. *Whether* Motion, or Fluxion, can *actually* exiſt, and be known, but by the next Increment of Space gone over, in ſome real and next Moment of Time; to which real next Increments of Space and Time gone over, the Nature of Motion immediately refers; and to which it's Quantity is immediately proportional, being in the *Ratio* of the next Increaſes of Space, gone over in the leaſt Time: In which Time is conſider'd as continually and uniformly flowing (as uniform Motion flows over Space) for the Standard Motion, by which all other Motion (variable or uniform) *actually* flowing over Space by *Gravity*, or *projectile* Force, is meaſured and compar'd, from ſome given Law of Velocity.

The Anſwers to the foregoing *Queries* being admitted, 4. *Whether* it will not follow from them, that there is *no* Motion, but by the relative Succeſſions of the next relative Increaſes of *Space*, in the leaſt *Time* gone over? Being as ſo many Succeſſions of Motions (differently uniform, or differently variable and uniform) at every *different Point* of Space and Time; at whoſe intermediate Points of Succeſſion are the *Powers of Velocity* producing thoſe *Effects* of next Diſtances gone over, at any two Points of Space, and Time arrived at. Which Power of Velocity, and Difference of Space, ſtill to be arrived at, in the next ſucceſſive Inſtant of Time (*if Time is allowed to have Difference*) diſtinguiſhes between a *Fluxion*, and an Increment of a Quantity; or between the Cauſe, in Power of Motion, and it's Effect.

ANSWERED.

BUT Time, and Motion, flowing over Space, being reſpectively conſidered, as two fluid Streams, geometrically, and continually flowing on, without Interruption, Succeſſion, or Addition of leaſt Parts, that can poſſibly be aſſigned, as to the Diſtances gone over, (*ſince no Quantity can be aſſign'd, or imagin'd ſo ſmall, but* *there will ſtill be ſmaller)* the reſpective Degree of Velocity of Motion, or Fluxion (i. e. *the inſtantaneous Velocities)* of that Flowing, at any Inſtant of Time, and Point of Space, of the Time, and Space gone over, will be every where aſſignable by the immediate Increments, as Effects of thoſe preceding Velocities, as has been ſhewn. Whence it will follow, that certain Degrees of Motion, Fluxion, or Velocity, exiſt at every Inſtant of Time taken, and Point of Space reſpectively deſcribed; contrary to the *differential* Notion that Foreigners have of ſuch Matter; *being in Proportion, every where, of the next ariſing* Differences, *of Time and Space, gone over*; that is, at the *Beginning* or *End* of Increaſe, of that Time, and Space, gone over; which *Extremes* are repreſented by *o* *, and it's relative *Point*, *Line*, or *Surface*, in Motion.

Mathematical EXERCISES.

PROBLEM I. By *Reciprocal*.

As *Re-action* is always equal, and contrary to *Action*, Whether he that receives, or ſtrikes the Blow, is the greater Offender?

PROBLEM II. By *Point-Blank*.

How muſt a *Projectile* be thrown to ſtrike the Object with the *leaſt Impetus* poſſible?

PROBLEM III. By *Blank*, F. R. S.

To determine the *Hyperbolic* Logarithm of the Cypher *o*? [*To be continued.*]

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* *o is the* Algebraical, *or numerical Value of the* Beginning *or* End *of Increaſe, of* Geometrical *Length, uniformly gone over, which no other* Algebraic *Quantity can* truly *repreſent*; $\frac{1}{1000}$, *&c.* ad infinitum, *being but a numerical* Aproximation *of* o *Value Geometrical, to which it can never* accurately *converge: As* o *and it's* Powers *into ſome* variable *Quantity, is the algebraical, or numerical Value of the* Beginning *of Increaſe of all Quantity, deſcribed by variable Motion. And the* geometrical *and* algebraic *Increments flow together*. See p. 27.

THE

PHILOSOPHIC VISION.

Laus & Honor Digniori.

NATURE is ſometimes more communicative to us in our Sleep, than when we are awake, by laying before us Objects of which we had no Notion. This occaſioned ſome ancient *Philoſophers* to imagine, that the *Soul* quitted it's earthly Manſion during that *Interval*, to expatiate over the Univerſe, to enlarge our *Ideas*, and to furniſh Matter for future Speculation, of which the following Inſtance is left to the Reader's Conſideration.

Returning from an Evening Walk, I fell into a deep Sleep, when methought I was approached by *Pallas*, who led me to the TEMPLE of SCIENCE, which was placed on the Summit of a ſteep Hill, to be aſcended by a great Number of Steps as ſlippery as Glaſs. I got up which with much Difficulty, and there beheld the GODDESS of SCIENCE ſitting on a Throne of Gold, with a Crown of Stars on her Head. On her right Hand ſat *Arithmetic*, *Algebra*, *Geometry*, and *Aſtronomy*; on her left *Painting*, *Sculpture*, *Architecture*, *Poetry*, and *Muſic*; at her Feet all the other Arts were plac'd in proper Order. When I had done admiring the Richneſs and Beauty of the Temple, and the dazling Splendor of the *Deity*, I turned my Eyes towards the Vale below, and took a View of the Precipice over which we aſcended.

Here I beheld a Crowd of Votaries coming from all Parts to pay their Devotion. Some, after having got up a few Steps, tumbled down again, and lay ſprawling on the Ground: Others crawled upon their Hands and Knees, and, with their utmoſt Efforts, endeavoured to reach the Top of the Hill; but alas! many of theſe, after all their Fatigue, precipitately rolled down again, like *Syſiphus*'s Stone, with very great Velocity; and their Labour prov'd in vain.

While I was contemplating the precarious Situation of theſe Pretenders to Knowledge, and reflecting upon the Folly and Danger of the Attempt, *four Perſons* ruſhed by me into the *Temple*, and made up to the Foot of the Throne, where they delivered Petitions, ſetting forth their Abilities, and claim'd the Reward due to their reſpective Merits.

The firſt Perſon appeared with a *Mathematical Exerciſe*, and Advertiſements in his Hand, was introduc'd by the *Goddeſs of Dulneſs*, to her ILLUSTRIOUS MAJESTY on the Throne, who, on Examination, prov'd over-opinionated of his own Notions, and, as he cou'd not bear Correction, was found to fly in the Face of Truth, and propagate Error to ſupport fallacious Argument. Hereupon he was ordered by the DEITY to retire, and learn to reform his Manners, ſtifle his Conceit, commence a real *Honeſtus*, and improve his Veracity by drinking plentifully of the Fountain of *Morality*, before he cou'd be admitted to a Seat of Honour in the Temple.

The ſecond Perſon was a *ſtately Gentleman*, introduced by the above-named *Goddeſs*, with a Belt hanging croſs his Shoulders, ornamented with a *Star*, to denote his Dignity, on which was written this Motto: *A Cypher is no Algebraic Quantity.* *The* GODDESS *of* SCIENCE ſoon diſcover'd that he was vain, addicted to Cavil, and greatly over-valued himſelf, and his Abilities, recommended him to the Practice of Humility and Condeſcenſion; it appearing alſo, that he had failed in the Performance of many Promiſes, to the Diſhonour of Truth and Science, by Letters under Hand, produc'd before her *illuſtrious* MAJESTY, ſhe ordered him to retire, and take Inſtructions from *Memory* and *Sincerity*, her two Siſter Goddeſſes, before ſhe cou'd prefer him to the Dignity of F.R.S. *Momus* being preſent, congratulated this Gentleman on his expected Honour, who thereupon *ſtifly* bow'd, and went away.

The *third Perſon* was cover'd with a *Maſk*, and ſurrounded by numerous Pupils and Auxiliaries, who alternately praiſ'd him as he advanc'd towards the THRONE, till the Temple was fill'd with confuſ'd *Ecchos!* at which the GODDESS of SCIENCE ſeem'd ſtartled!—He coming before her, ſhe ordered the *Goddeſs of Dulneſs* to unmaſk him, who, proud of her favourite Son, fondly adorn'd his Temples with a Garland of *Poppies*, dignifying him, at the ſame Time, by the Title of *Grand Magnifier of Fluxions!* Then ſhe led him right before the THRONE, where he fell, Supplicant to the ILLUSTRIOUS GODDESS, on his Knees, and pointed to an Altar of Books at ſome Diſtance, that were erected by his Auxiliaries. *Momus*, now ſmiling, intimated that the ſaid GODDESS ſhou'd inſpect the Pile, to ſee for what Cauſe he *wou'd be* dignified.

He was thereupon diſcover'd to be a Perſon of fertile *Genius*, ill cultivated; like a rich Soil, bringing forth Weeds and Corn promiſcuouſly;—that he cou'd conceive better than communicate; knew *more* than he cou'd *define*; and had compiled from the Writings of others, what he had never digeſted, nor was able to teach.

The ILLUSTRIOUS GODDESS told him of his Defect in Manners and Education; and recommended him to be more ſociable with her true Sons of Science. Never more to aſſume *borrow'd Titles*, but to be contented with his own for the future. Never to overvalue himſelf for a Reputation rais'd by the Abridgment of the Works of others —— Nor by cavilling about *Annuities*. Nor yet to *ſcreen* himſelf behind the Curtain, to appear more conſiderable than he *really* is, by the Defence of others, appearing for him. She then ſmiled, and ordered him forthwith to be made F.R.S. and Deputy Profeſſor of Artillery and Fortification; at the ſame Time ordering him to withdraw.

The FOURTH was a Perſon of ſolemn Aſpect, dreſs'd in a plain Habit, diveſted of all outward Ornament: The *Goddeſs of Dulneſs* look'd at him with Scorn, as he paſſed by: *Momus* ſeem'd frighted, withdrew behind the Throne, and a profound Silence enſued. On his near Approach the Court aroſe, and ſhewed him Reſpect. FAME ſounded her Trumpet and filled the Temple with Joy! when the GODDESS of SCIENCE herſelf, riſing from the Throne, accepted his Offering of two incomparable Treatiſes, of FLUXIONS, and TRIGONOMETRY; which being ſtrictly examined, they were declared to be written in regular Method, connected like the Elements of *Euclid*, founded on the *Newtonian* Principles, and perfected, by containing not a Word too little or too much.

The ILLUSTRIOUS GODDESS, ſmiling full on him, celeſtial roſy red, forthwith ordered his Name to be inrolled in the Liſt of her immortal Sons, and then placed him next her, on a Seat at her right Hand, in the *Temple* —— Mean while all the attending *Arts* ſung *Chorus* to his Praiſe and Honour; and the Concave of the Temple rung with Acclamations, which awaked me.

VISIONARIUS.

EMENDATIONS *and* CORRECTIONS, *to be made with the Pen, before reading the Contents.*

All the Values of the geometrical Increaſes flow'd over, in finite Time, can never be algebraically expreſs'd in infinite Time; in which Senſe the *algebraic Increaſes* being again diminiſh'd, are ſaid never to converge to the Limits of their geometrical Magnitudes in Motion, but will ſtill have ſenſible Value; yet ſuppoſing the geometric Increaſes, and their algebraic Values to flow and decreaſe alike, to ſomething determinate, then *o*, and *o*, and it's Powers into a variable Quantity, and it's Powers, will accurately expreſs the *Limits* of variable Quantities, or Beginnings of their Increaſes; which *Limits*, or *Beginnings of Increaſes* of Quantities, are, accurately, as the Fluxions of thoſe Quantities in general.

Pages.	Lines.	*for*	*read*
3	3	Poſitives	Poſitions.
3	33	following	flowing.
10	2 & 3	- -	Comma, at knows, and Manner.
11	10	- - -	Comma at Relative.
	31	- -	Comma at paſs'd over.
14	39	- - -	which, moreover, is a Book, *&c.*
21	18	- - -	Increaſe of Altitude (blot its) at the Extreme of *either* Axis.
21	32	- - -	Never can accurately converge to them, in infinite Time, decreaſing in all the poſſible numerical Variations, that can be expreſs'd, tho' geometrically flow'd over in a finite Time.
27	8	Paces	Spaces
30	31	that *x* is not, *&c.*	that *x* Feet is not as the Square of W;